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Aerial View of the White House, Washington, D. C.

Photo U. S. Army Air Service

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SPECIAL FEATURES

THE INSTALLMENT OF AN AIRPLANE ENGINE
THE CANADIAN AIR FORCE
"WHO'S WHO IN AMERICAN AERONAUTICS"
DORNIER ALL-METAL MONOPLANES
LESSONS OF THE GORDON BENNETT RACE, 1920

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The Poor Mariner

HERBERT HOOVER, Secretary of Commerce, has put his practical mind to work on the overlapping and duplication of government departments. Without thinking of what the airman will probably have to do if aviation continues to "decentralize" and scatter its activities among the many departments, he tells of the bewildered mariners:

"He must obtain his domestic charts from the Department of Commerce, his foreign charts from the Navy Department and his nautical almanac from the Naval Observatory—and he will in some circumstances get sailing directions from the Army. In a fog he may get radio signals from both the Navy and Commerce, and listen to fog horns and look for lights and buoys provided him by Commerce; if he sinks, his life is saved by the Treasury. He will anchor at the direction of the Army, who rely upon the Treasury to enforce their will. His boilers and life boats are inspected by the Department of Commerce, his crew is certificated by one bureau in Commerce, signed off in the presence of another and inspected at sailing by the Treasury and on arrival by the Department of Labor".

The question naturally arises as to whether the President's suggestion of establishing a bureau in the Department of Commerce, as the "fifty-seventh" Governmental agency attempting to control aviation was written with Mr. Hoover's advice.

Helium for Aerostatic Purposes

THE properties of helium and its use for aerostatic purposes are very completely treated in a recent issue of *The Journal of the Franklin Institute* by Richard B. Moore, Chief chemist of the U. S. Bureau of Mines. One striking fact brought out by Mr. Moore is the necessity for some larger scale method of storing helium for the purpose of having an adequate supply at hand when required. This would seem to operate against the possible commercial use of helium for airships even more than would its initial cost, for the latter can with the process of repurification brought down within reasonable limits.

The principal objection to the commercial use of helium, however, is not even mentioned by Dr. Moore in this connection. This objection is the deficient lift of helium compared to hydrogen. Pure helium lifts about 7 per cent less than pure hydrogen, and to this must be added that, for the present at any rate, there seems to be no practical method for producing helium in as pure a state as hydrogen. Thus, the highest percentage of purity predicted with any assurance by Dr. Moore is 94 per cent, whereas hydrogen for airship inflation can very readily be produced up to 98 per cent purity.

The discrepancy between the practical lift of helium and hydrogen is then greater than would appear from purely theoretical considerations. At the very best, it seems hardly reasonable to expect that aerostats inflated with helium will have more than 90 per cent the lift hydrogen generates. Now, 10 per cent does not seem a very great loss when it is applied to the gross lift; but when we subtract 10 per cent of the gross lift from the passenger or cargo carrying capacity, it puts a very different face on the proposition.

Supposing that in a hydrogen-filled transatlantic airship 30 per cent of the gross lift would be allowed for carrying passengers and their accommodations, the substitution of helium for hydrogen would result in cutting down the passenger capacity by one third, for the gross weight would be practically the same, the volumes of the two ships being equal, though the structural weight might be somewhat smaller for the helium ship.

What is then the answer to the helium problem? As we see it, it is simply this. Helium is a very important contribution to the war-time use of balloons and airships because it makes them almost invulnerable against incendiary projectiles. We say almost, because the inflammable fuel carried by aircraft still makes them liable to being brought down in flames. For commercial use, however, the drawbacks of helium seem to more than outweigh its advantages. After all, the cases are extremely rare, outside of actual warfare, of an airship catching fire in the air. The percentage of airplane fires has undoubtedly been fully as great as that of airships, although there are no statistics to prove it absolutely. Hydrogen in proper purity is not explosive, as is popularly imagined. It will only burn, as any inflammable gas will, on reaching the air, that is, it will burn on the surface, like a gas jet, but the flame will not ignite the entire volume of gas as long as the aperture does not get larger.

This very important point brings us to the realization that airships are inflammable not so much by reason of using inflammable gas, but because the envelope is not proof against combustion. Theoretically, then, an airship can be thoroughly protected against fire by fire-proofing the envelope. In practice the problem is much more difficult to solve, but all things considered it seems to offer a better promise for commercial success than the use of helium. Until this problem is solved we will have to be content with guarding against the causes of fire.

Flight Testing

IT is interesting to hear of Anthony Fokker's opinions—the views of a pilot-designer—on the essentials of flight testing. According to him a machine should possess sufficient directional stability on the take-off run and, as soon as its flying speed is reached, it should take the air without the use of the elevator.

In flight there should be no hunting, either horizontally or vertically. The change from power flight attitude to gliding flight attitude should be automatic and rapid, and even at the smallest flying speed the wing flap control should be effective. In turns there should be no tendency at nose-diving or spinning, while in side-slips the machine should still be controllable.

Official Report on Air Mail Service

Third Year of Operation, May 15, 1920 to May 15, 1921

The Air Mail Service, which was three years old May 15, had during the past year a general average performance of 78 per cent of trips completed and 83 per cent of miles completed. Its best general monthly average performance was 95 per cent, in July, 1920. It had a general average performance of 90 per cent of trips completed during April, 1921, when the very worst weather of the year prevailed. Violent snow storms over the Rocky Mountain district and dense fogs and cloudy conditions were encountered during that month over the eastern portion of the air mail routes. The New York-Washington route has completed its eighth consecutive week with 100 per cent performance.

During the past year the Air Mail Service has covered 1,313,379 miles with mail. It carried 1,015,053 lb. of mail which amounted to 40,602,130 letters. The cost of its operation for the year, with April estimated, was $1,342,362.67. The average cost per mile was $1.02.

The routes now in operation are the transcontinental route from New York to San Francisco via Cleveland, Chicago, Omaha, Cheyenne, Salt Lake and Reno, a route from Chicago to Minneapolis, another route from Chicago to St. Louis, and the route from Washington to New York.

Fatalities

The fatalities for the past year were thirteen pilots, five mechanics and one official, almost twice as many as for the first two years. This, to a certain extent, was due to the greater hazard of operating the transcontinental route, which was established during the year, over two ranges of mountains, while the operation of the Air Service for the first two years was confined almost entirely to the Washington and New York route. Seven of the fatalities were due to defective mechanism of a certain type of plane which has been discarded, six of the fatalities occurred while not carrying the mail, either on the field or in ferrying ships to various points.

The loss of these lives is the distressing feature of the development of aerial navigation. Every effort is being made by the Air Mail authorities to develop devices and airplane mechanism which will prevent as far as possible these unfortunate accidents. Each accident and every experience in cross country flying increases the knowledge of aviation both for national emergency and for commercial aeronautics. Every great advance in science more or less pays its toll in human life.

Flying Difficulties

The difficult part in aviation is flying over the mountain ranges. On the air mail route from New York to San Francisco the Allegheny Range is encountered with a great many fogs and low hanging clouds at certain seasons of the year, while on the western end of the route the Rocky Mountain Range with its many blizzards is encountered. Under these conditions pilots usually fly low and follow valleys and river courses if possible. Flying at a speed of 90 or 100 m.p.h., it is difficult to recognize localities with only a momentary glimpse of an object in a fog or storm.

It is not the policy of the Post Office Department to require pilots to start on their trips under weather conditions that will endanger their lives, but they sometimes meet with bad weather conditions after starting which cannot be forecasted. In their eagerness to complete their trips and test their flying skill under these difficulties, they sometimes fly blindly over cities and mountain ranges not knowing what moment they may crash into some tree, mountain side, or other obstacle. Quick thinking and action are required, as well as nerve, in such emergencies.

Flying Experiences

The experience of one aviator flying over the states of New Jersey and Pennsylvania in his flight from New York to Bellefonte, Pennsylvania, is given in a report, in part, as follows.

"The ceiling was 75 ft." says the aviator, referring to the distance from the ground to the foggy or cloudy conditions, "and the visibility poor. I followed the shore of Staten Island when the ceiling closed down to almost zero. Flew blind over South Amboy, followed railroad to the Delaware River below Trenton, intending to follow the river to Allentown. Turned up the river and flew blind through several places where the fog was right down on the water. Tried to follow the right bank of the river, caught glimpse of shore but turned too quickly and lost it. Picked up the left bank in the same manner, then the right again. Turned and a steep hill loomed up 50 or 75 ft. ahead. Opened the motor wide and tried to fly over it, succeeded in getting to the top just clearing the tree tops when the ship stalled. I pushed the nose down as much as I could without deliberately diving into the trees and came to an open space in the last spare second. I pushed the nose still further down and was picking up speed when trees loomed up again some 75 or 100 ft. away, considerably higher than I was. Not having sufficient speed a crash was inevitable. I closed the throttle and pulled the stick clear back about one second before the landing gear struck the ground eight feet from a stone wall and a row of trees. The ship went on her nose and the tail crashed into the trees which prevented it from going further."

Another aviator flying over the same route says: "Flew at 2,000 ft. catching occasional glimpses of the ground until reaching the Delaware River, which I was able to see through a hole in the fog. Dived down to the river and attempted to fly down stream. This proved to be impossible owing to the fact that the fog was right on the water and no ceiling." This pilot states that he climbed through an upper strata of clouds breaking through at 7,000 ft. After flying for some time he saw a black spot in the clouds and dived down through it to within 25 ft. of the Lehigh River. Thus he continued up through the clouds to find a clear place and then down again through a hole in the clouds endeavoring to find his locality. Engine trouble developed before he was able to locate himself and he was obliged to alight among some trees on the mountain side.

One of the air mail pilots whose machines crashed into the mountain near Jasper, Nev., last month while flying over the western end of the transcontinental air route encountered a violent blizzard. The snow was so dense that visibility at 50 yd. was the maximum. He cleared one range of mountains when another mountain came suddenly into view 50 yd. ahead. He promptly pulled his guiding levers to the limit, hoping against hope to clear the mountain, but the crash was inevitable. Another pilot flying between Chicago and St. Louis recently through a sleet and snow storm was so cold, sore and stiff when he reached Chicago, that he had to be assisted out of his ship. Fortunately no fatalities occurred in these accidents.

Useful Map of Ohio for Aviators

First Lieut. Charles McK. Robinson, A. S., desires to bring to the attention of pilots and others interested in aviation a recent map entitled "The Railroad Map of Ohio", published by the State Commissioners of Public Printing, Columbus, Ohio. This map is of particular value in cross-country flying because of its many distinctive features not ordinarily found on any one map. Railroads are shown by different colored lines, rivers in blue. Special insert maps on a larger scale of Cleveland, Cincinnati, Columbus, Toledo, Dayton, Akron, Youngstown, and Canton show public grounds and buildings blended in with a color scheme that very clearly brings out the important features. The size of the map is 34 x 44 inches in covers 4½ by 9 inches. Scale 1,500,000. Price on bond paper 40 cents, with roller for wall use, 10 cents extra.

The Canadian Air Force

The report of the Air Board of Canada for 1920 contains interesting information on the organization of the Canadian Air Force.

The Air Board was reorganized by Order in Council No. 826 dated Apr. 19, 1920. The original Board, having completed the preliminary work of organization for which it was appointed, resigned, and a new Board was appointed in its stead under the chairmanship of the Hon. Hugh Guthrie. Col. O. M. Biggar was reappointed Vice-Chairman, and the heads of the Flying and Administrative Services of the Board (Air Vice-Marshal Sir W. Gwatkin, Inspector General of the Canadian Air Force, Lt.-Col. R. Leckie, Director of Flying

THE HON. HUGH GUTHRIE, P. C., K. C., CHAIRMAN OF THE AIR BOARD OF CANADA

Operations, and Lt.-Col. J. S. Scott, Controller of Civil Aviation) were made members. Capt. W. Hose, Director of the Naval Service, and Dr. E. Deville, Surveyor General of Canada, were appointed to the remaining vacancies.

The position of Secretary became vacant at the same time through the resignation of Major A. M. Shook, on account of ill-health. Mr. J. A. Wilson, Assistant Deputy Minister of the Naval Service, and member of the original board, was appointed to the vacancy. Other officials are: Director of Technical Services; Lt.-Col. E. W. Stedman, Director of Medical Services, W. H. Cronyn; Director of Equipment, H. C. Craig; Intelligence Officer, F. C. Higgins; Chief Accountant, F. X. Talbot.

During the year Board meetings have been held as necessary. In addition, a Departmental Committee, consisting of four members of the Board (the Vice-Chairman, the Inspector General, the Director of Flying Operation, and the Controller of Civil Aviation), together with the Secretary, the Air Officer Commanding the Canadian Air Force, and the heads of the Technical and Equipment Branches, has met regularly since its formation on Aug. 21.

The Board exists for three purposes:—

(1) The regulation of civil aviation.
(2) The conduct of civil government operations.
(3) The air defence of Canada, including the organization and administration of the Canadian Air Force.

Accordingly there are three main divisions, each of them controlled and directed by an adequate and efficient staff, and to minister to their common requirements there has been established a departmental organization, which serves to prevent overlapping and duplication of work. The chart shown on the following page will explain more clearly what is meant.

COL. O. M. BIGGAR, K. C., CANADIAN AIR FORCE, VICE-CHAIRMAN OF THE AIR BOARD OF CANADA

Canadian Air Force

The formation of the Canadian Air Force was approved by Order in Council No. 395, dated Feb. 18, 1920. After reviewing the general situation in regard to military aeronautics, the order points out that as war strength in the air must ultimately depend on civil or commercial aviation, war formations, under present conditions, should exist on paper, and not in the form of embodied units, and that training for war should be periodic, intensive and widespread. For this reason it authorizes the formation of the Air Force on a non-professional basis, and makes provision for the training of the great bulk of the flying and ground personnel for one month every two years. It recognizes, however, that for the proper organization of the staff and for instructional work a longer period of duty is necessary. The employment of officers and men for such duties for a period of not more than one year is therefore permitted.

On Apr. 23, Major-General W. G. Gwatkin, formerly Chief of the General Staff, Canadian Militia, was appointed Inspector-General of the Canadian Air Force, with the rank of Air Vice-Marshal; and on May 17, Air Commodore A. K.

Tv'ee, O B E , appointed Air Officer Commanding for a period of nine months.

A call to officers and men who had served in the flying services during the war was issued and met with a gratifying response.

A provisional establishment of 1,340 officers and 3,905 airmen was authorized by Council on June 30, and a small Headquarters Staff for general administration was then appointed, and an advance party sent to Camp Borden, July 5

Camp Borden was transferred from the Department of Militia and Defence to the Air Board for use as a training center early in July. The Regulations of the C.A.F. were approved on Aug. 31, and No. 1 Wing was formed at Camp Borden on September 7 This comprises the following units—

1 School of Special Flying—Avro training machines.
2 No. 1 Squadron—(a) One flight of fighting scouts. (S E 5.)
(b) One flight of bombing machines (DH. 9a) and night flying training
3. Ground Instructional School —
(a) Engine Repair Section
(b) Aircraft Repair Section.
(c) Radiotelegraphy
(d) Photography
(e) Gunnery
(f) Navigation
4. Equipment Branch—Technical, non-technical, and quartermaster's stores and motor transport.
5. Victualling Branch.
6. Medical Branch.
7. Camp Maintenance—(Civilian employees only).

Camp Borden is one of the finest flying grounds in existence. Training will be continued all the year round No difficulty has been experienced in maintaining the work during the winter months. On the contrary, it is expected that the camp will be busier in winter than in summer, as many pilots and mechanics will find it more convenient to take their training in winter, when commercial work is usually less.

During October, November and December 86 officers and 11 airmen completed courses in training. On Dec. 31, 50 officers and 209 men were in training, making a total for the first three months' work of the C.A.F. of 456 officers and airmen trained or in training. The general average time in the air of each pilot taking the course was 6 hr and 6 min, and the total flying time was 934 hr. 15 min. No accident of any nature requiring medical assistance has occurred during this time.

Employers of labor are cooperating readily with the Air Board and assisting the work by allowing employees leave to take their training

Aviation companies and commercial pilots are finding the Air Force training of great benefit in providing schools of instruction in all matters relating to flying. Men are given every assistance and encouragement to increase their efficiency, with consequent benefit to themselves, their employers, and the public generally

As Camp Borden has no facilities for flying water-machines, arrangements have been made for attachment of flying officers to the Civil Operations Branch Station at Vancouver or Halifax, for short periods of instruction in the handling of seaplanes

Cooperation with the Naval Service, the Militia Department, and the Royal Canadian Mounted Police, has been secured, and is maintained, through the medium of the Defence Committee, on which the Inspector-General represents the Air Board. Attention has been given to general questions relating to measures of defence, plans for combined training have been considered, and arrangements are being made for the execution of tactical schemes in which the three services—Navy, Militia, and Air Force are intended to take part

For purposes of liaison, officers of the C A F are attached, each for a period of six months, to the Air Ministry in London, and so far as practicable, the C.A.F. will be trained and equipped in the same manner as the Royal Air Force.

Air Mail News

"Semi-Dark" Flying, Minneapolis-Chicago

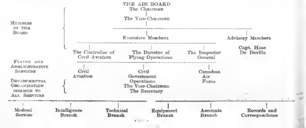
Inauguration of "semi-dark" flying schedules for the air mail service between Minneapolis and Chicago is now being considered. The proposed plan is to have the mail ships leave Minneapolis and Chicago at 2 30 a.m arriving in time for the first morning mail deliveries.

The plane from Chicago will carry that Chicago, St. Louis and Eastern mail for Minneapolis which has failed to make connections with the mail trains the evening before. It will get this mail here at about the time the train arrives.

Similarly the plane from Minneapolis will carry the mail which has got into the postoffice too late for the evening Chicago trains and will enable it to be delivered early in the morning in Chicago or to make Eastern connections.

Two New Air Mail Routes Planned

Two additional air mail routes out of Salt Lake are being considered by the Post Office Departments, one to Los Angeles and one to Denver, according to Colonel John A. Jordan, superintendent of the western division of the United States Air Mail Service. Both Los Angeles and Denver business men are supporting the movement and the government is favorably inclined to the plan he says. The two proposed routes may be established early in the summer.



The Installment of an Airplane Engine

By A. J. Rowledge

It has been remarked that more accidents occur due to installation than to engine failure If this is true, the subject is one that is well worth careful consideration and discussion to see what we can do to eliminate the causes of trouble in view of our responsibilities to the flying public. It is a subject that can be approached in many different ways. We can take the smaller points of the detail arrangement of parts and this sufficiently important to warrant the whole Paper. Then there is the question of the position of the motor or motors, whether a central engine-room with shaft gear to drive to the propellers is desirable. We may also consider whether the propeller should be direct coupled to the crankshaft and whether gearing should be used at all In fact, the subject can be very easily made too wide, and I will limit myself to a few definite points, first by limiting myself to the water-cooled engine installations and then as regards data and illustrations to one particular engine, the Napier "Lion".

In a complete aero-engine installation the main factors are weight, power and reliability When considering weight, we should take the whole weight of the power plant, including tanks and fuel

In talking of power, we should take the thrust horse-power, and if possible deduct the drag due to cooling when making comparisons

I will take first the part of the subject which is worthy of greatest attention—the detail troubles which may prevent a perfectly good engine from functioning properly

What are these troubles? They are mainly —

(1) Failure of the fuel supply
(2) Failure of the oil system.
(3) Failure of the ignition.
(4) Overheating.
(5) Fire.

I think engine-starting accidents should be included with these, as means can be taken to prevent them with any engine, except perhaps the rotary type

Fuel System

Now the fuel system is undoubtedly difficult to make absolutely free from troubles, but a little modification and experiment should cure most of them and reduce the care the system requires in use

The main gasoline tank is usually so low that the fuel has to be pumped from it, generally to a gravity tank feeding the carburetors. It is often very difficult to arrange a gravity tank with sufficient head, and the arrangement of a wind driven pump delivering to a junction box with branches to the carburetor and the gravity tank gives a useful addition to the available head when flying A cock must be fitted between main tank and the junction box to prevent the pump pumping air into the system when the main tank is empty, and to prevent gasoline from the gravity tank running back to main tank when standing With a suitable pump and relief valve a cock may be fitted between the gravity tank and the junction box. In the Airco (DH) machines the cock is combined with the junction box in such a manner that by the movement of one handle the feed can be either from the main tank or the gravity tank, or both It is necessary to provide an overflow from the gravity tank leading to the main tank to take the excess supplied by the pump A flow indicator fitted in this pipe will show when the main tank is empty and is often fitted

Engine-driven pumps will almost certainly come into general use, and this step will improve the reliability. Pumps are usually fitted in duplicate, and especially in large machines a hand pump is also provided to feed the gravity tank. In very large multi engine machines, particularly for military purposes, the whole system is much more complicated.

* Extract from a paper read before the Royal Aeronautical Society of Great Britain

Oil System

Oil pipes are a constant source of trouble. There is one sovereign remedy—do away with them. I quite expect one day to see an installation with only one oil pipe from the reserve oil tank to the engine, and for flights up to 3 or 4 hr., none at all. This means, of course, that the oil tank will again become part of the engine. In making this statement I am considering mainly civil aviation machines as certain military ones run under somewhat different conditions, and the same simplicity of arrangement is not always possible.

Sufficient oil cooling is easily provided. All installations of new design should be fitted with thermometers to check the oil temperature.

Good and easily accessible oil filters must be fitted, as they should have frequent attention.

Failure of the Ignition

Ignition failure is usually a matter of the magneto, either due to unreliability of the magneto itself or due to the machine suffering from an oil or water bath or too much heat.

It is essential to fit two entirely independent ignition systems to ensure reliability, and with the size of cylinder usual in aero-engines the gain in power from having two plugs in each cylinder is considerable. It is usually possible to find from among the various plugs on the market one that will suit any particular engine and be reasonably reliable. If the installation is thoroughly gone over on the first experimental machine, the correctness of the general design should be established, so that only the detail parts require attention

With an adequate supply of fuel the float feed certainly requires attention. We make our floats much too small, with the result that to obtain the necessary effort to close the needle valve they have to be made too thin and flimsy. A little more weight—a few ounces—and I think the float feed can be made beyond reproach as a reliable unit A float feed can be made to work satisfactorily with a head of only 18 in. if the size is not restricted

The pipe lines should be carefully studied so that air is not trapped, and then we come to one of the major troubles—the pipes themselves and their joints. The life of rubber joints is much too brief, especially if benzol is used in the fuel, and some change is urgently required. I believe that if we adopt, as has been suggested, a fairly heavy gauge steel tube for our pipes and use rigid joints, we should find a way out of the difficulty The pipes should be arranged so that deflection is taken in torsion and the tube designed so that it is not overstressed by movements of the frame carrying it

Carburetor float chambers will again require altering to be strong enough to take the feed connection when all-steel pipes are used, and the connection to the fuel tanks will require careful consideration as well to prevent the fairly rigid pipe from causing leaks.

The fitting of an adequate filter is, of course, necessary. Improved means for telling the pilot the amount of fuel he has left in his tanks is desirable.

Overheating

With respect to overheating this appears to be a matter of having sufficient cooling surface allowed for the worst conditions and fitting shutters to keep the engine warm under more favorable circumstances. Several ingenious arrangements have been made to reduce resistance loss when the whole of the cooling is not required. The Airco 18 and the Fairey installations are both examples of one of the latest schemes, each having the radiator under the engine with shutters in the nose to control the air flow through the radiator

If the cylinders are smooth they should be used as cooling surface as much as possible, as a square foot of surface here is much more valuable for cooling than a square foot of radiator tube.

A well-arranged water system gives very little trouble, and difficulties under this head should not exist, at all events in temperate climes.

Fire

The first rule to make to lessen fire risk is that the carburetor intakes should be carried outside the cowling to carry any flame from a back-fire clear and that all fuel due to flooding should drain directly overboard. It is also desirable that the engine should have the cylinders grouped as regards mixture pipes, each group having its own carburetor, so that in the event of trouble due to valve failure in one group, the remaining groups will carry on and suck out any fire in the faulty one.

Exhaust pipes require to be suitably carried to prevent overheating of any part of the machine and to be strong enough not to burst open at some inconvenient place.

The magnetos should be of a fireproof type, and all the wiring arranged so that a spark from the ignition cannot start a fire.

The position of the fuel tanks and the arrangement of the pipes are both very important. There should be the minimum amount of gasoline piping in the engine compartment, and certainly the lower the carburetors are in the installation, the less the risk that need be run.

When the installation has been made as safe as possible by attention to the above points and to preventing any accumulation of gasoline or oil in pockets in the engine compartment, a fireproof bulkhead should separate this compartment from the rest of the machine. Any pipes or control rods that pass through the bulkhead should have fitting bushes.

We shall thus considerably reduce the risk of fire, and in the event of a flame starting it will quickly burn out if it cannot reach any inflammable material.

Engine Starting

Engine starting should always be accomplished without propeller swinging, if necessary, by fitting gearing and a crank handle.

I have very little sympathy with electric starters owing to their weight and complication. An engine should be able to be started as long as there is gasoline in the tank and not be dependent on the small batteries that can be carried.

The Lion engine is fitted with what we usually call a gas starter. It consists of a vaporizer connected to the engine mixture pipes by a pipe controlled by a cock. A hand pump is provided which blows through the vaporizer, charging the mixture pipes and cylinders with a suitable mixture for starting. To enable the cylinders to be charged, one each of the inlet and exhaust valves can be held open. A suitable cock is provided so that the pump can scavenge the cylinders with fresh air to give constant conditions in the cylinders before charging. The usual hand magneto is used to provide the spark for starting.

These engines can always be restarted in the air if the machine has sufficient height by lifting the valves, the engine immediately windmilling. When it is spinning the valves are dropped and the ignition switched on and the engine is restarted.

Engine Control

All controls should be by rods and levers, and flexible cables should be discarded. The throttle and mixture strength levers should be mounted together and so arranged that when the engine is throttled down the mixture lever is brought back to the right position, otherwise if the pilot forgets to return it he may stop his engine when opening up at a lower altitude. I prefer the interconnections to be on the control quadrant and not on the engine, as it reduces the strains in the connection.

The ignition control is probably best coupled to the throttle control as it is certain a safer arrangement and there is no need for it to be left to the pilot.

Other Points

The choice of a suitable propeller is very important as effecting engine reliability. Personally I favor a machine with a good reserve of power, using a propeller that will allow the engine to develop full power when getting off and climbing. It is surprising what good results can be attained in propeller design in the direction of keeping down the range of engine revolutions. One of the best cases I have come across on the Napier "Lion" engine is from 1,950 stationary on the ground to 2,150 all out flying level at about 120 m.p.h.

This point is particularly important with high compression engines, which are liable to detonate badly if run for long at full power on the ground at low engine revolutions. If an engine is of light weight per b.hp. and economical when running at light loads—particularly the latter—there is no disadvantage, and a good reserve of power is left for climbing and for maintaining schedule time under adverse weather conditions.

In the maintenance of machines in service it is important to have all parts as accessible as possible, to have as little cowling

FIG. 1. ENGINE INSTALLATION IN THE AIRCO-18 CABIN AIRPLANE

to remove as can be arranged and that amount easily detachable.

One great advantage of placing the radiator elsewhere than in the nose is that provided a smooth engine is used, it requires little cowling. The Napier "Lion" engine, as placed in the Airco 18, has the upper part of the engine exposed, and the plugs can be changed without removing any of the cowling.

Actual Installations

Airco 18. Fig. 1 shows the installation in the Airco 18 used on the Paris service of the Aircraft Transport and Travel Co.*

The weight of the various parts of the power plant are:

Engine	860 lb.
Cooling	233 "
Tanks	142 "
Framework and cowling	110 "
Fuel and oil	875 "
Exhaust manifold, propeller and Miscellaneous	194 "
making a total of	2,414 lb.

or 6.36 lb. per h.hp. including the weight of the whole framework carrying the engine and engine cowling. The amount of fuel used in service is from 20 to 25 gal. per hour, and varies with the weather conditions. The weight of fuel included in the above is sufficient for 4 to 5 hours flight.

The whole framework carrying the engine is detachable by removing four bolts at the corners of the front end of the cabin, making it possible for a spare nose to be kept in the engine installation complete, ready to replace the ones in service with the minimum delay, preventing the necessity of laying up the machine whilst the engine is being overhauled. The fuel tanks are carried in the main body.

The engine is started by the special system of the engine makers, the controls and pump handle all accessible under the rear of the engine frame, the height of the fuselage from the ground making this a convenient position.

I have so far talked of the installation weights as lb. per b.hp. including fuel, and this rather hides the importance of the weight per b.hp. of the engine itself, and I should like to just touch on this question very briefly.

Taking the Airco 16, which has a total flying weight of 6,750 lb. when carrying a useful load of 1,470 lb., if the engine weight were increased by ½ lb. per h.hp. or 225 lb., in order to carry the same actual useful load with the same efficiency, that is, with the same flying weight per h.hp. the hp. would have to be increased to 533 and the total flying weight by 1,120 lb. to 7,989 lb., making a machine much more expensive to run and of greatly increased first cost, owing to the increase in size.

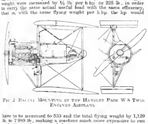


FIG. 2. ENGINE MOUNTING IN THE HANDLEY PAGE W 8 TWIN ENGINED AIRPLANE

Fairey Amphibian. This machine has the engine mounted in the nose. The radiator is mounted in the fuselage under the engine. The reserve water tank is carried in the front of the top plane and the outlet water pipe from the engine is carried through it, being perforated to allow air or steam to escape from the circuit. The tops of the cylinder blocks, projecting through the cowling, considerably assist in cooling the engine.

The main fuel tank is carried below the engine level and between the planes. A gravity tank is fitted immediately behind the water tank in the top plane. The oil tank is carried close to the back of the engine just below the bearers.

The engine controls are all coupled by means of rods to levers conveniently placed in the pilot's cockpit.

Handley Page W 8. The machine is fitted with two engines, each forming a self-contained power unit comprising engine, fuel tanks, oil tanks, radiator and water (Fig. 2).

The engine rests on armored wood bearers which are supported by a triangulated steel tube structure underneath and two vertical tubes above, braced by ordinary R.A.F. wires. This arrangement provides for the engine and tanks being offset outboard one foot from the point where the frame is attached to the plane hinges, thus saving two feet on the folded width of the planes without restricting the propeller diameter. The absence of tubes and bracing above the horizontal tank and engine bearers on the outboard side enables the engine and tank to be removed with the minimum of trouble. The radiator with water tank and altitude shutters is carried by flexible clips from the end of downward extended arms bolted to the front of the engine bearers and stayed at the top to the vertical tubes. A fire proof partition is fitted which entirely isolates the tanks from the engine. The 10½ gal. capacity oil tank fitted with air cooling tubes is placed across the tank bearers at the rear and connects via a large bore cock with the Napier oil strainer placed alongside. The tank is below the level of the engine connection when the machine is resting on the ground. The main gasoline tank is of rectangular section placed between the tubular bearers and fixed thereto by U-bolts. A vertical contents indicator is fitted to the top, visible from the pilot's seat and working over a scale 5 in. long; it is worked by a quickly detachable float arm. The gasoline system comprises a large filter with detachable gauze of 35 sq. in. area placed inside the bottom tube fairing and connected up to main tank sump. From the filter gasoline flows to the Vickers centrifugal wind-driven pump which feeds through to the carburetors via a pilot-controlled cock, the surplus passing up to the gravity tank under the top wing and then overflowing from there back to the main tank via the flow indicator let into the fairing of the vertical tube and visible from the pilot's seat.

Two additional small A.G.S. type filters are fitted close up to the carburetors and a hand pump is provided in the pilot's cockpit for use when starting up. In the event of the pumps

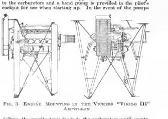


FIG. 3. ENGINE MOUNTING IN THE VICKERS "VIKING III" AMPHIBIAN

failing, the gravity tank feeds to the carburetors until empty, or one pump can be made to supply both engines via the fuselage. A cock is provided for draining the gravity tank when machine is in dock. The engine starting handle is fitted to a cross shaft below the cowling and drives to the engine by chain. The starting gear, consisting of vaporizer, pump and starting magneto, are shown on the drawing. The starting clutch and valve lever are fitted with cables and rings placed in a convenient position. The aluminum cowling is fixed to the framework in panels which can be quickly hinged open or removed altogether. A platform is built into the bottom plane for use of mechanics.

Vickers' "Viking III". The engine is located high up in the space between the upper plane and the deck of the hull, the principal supports being four steel tubular struts which spring respectively from the four main plane strut fittings on the deck (Fig. 3). In front elevation the main plane struts diverge from the deck fittings, and the engine struts diverge in such manner as to support the longitudinal engine bearers at the transverse pitch defined by the holding down bolts of the engine. The bearers are of ash, being connected transversely by steel tubes at their front and rear extremities, and all four sides of the truncated pyramid thus formed are braced with streamline wires.

The engine is mounted as a pusher, so that the power end is the rear with reference to the machine.

The radiator is supported on trunnions which are mounted on forward extensions of the ash bearers, tubular stays being carried from the upper part of the radiator casing to the under side of the front main plane spar. The whole of the front surface of the radiator is shuttered.

The three engine manifolds conduct the exhaust gases forward, i.e., toward the radiator, this direction being reversed by the application of U-shaped extensions which discharge the gases backward at a safe distance from the propeller.

Twin oil tanks are slung externally along the ash bearers, and the Napier oil filter is clamped upon the front transverse tube at about the same level.

The engine controls are actuated by a positive system of

* This firm has since been dissolved, but Airco (or DH) 18 airplanes are used on the London Paris airway by the Instone Air Line.—EDITOR.

push and pull rods which pass up from the pilot's cockpit by the front starboard leg of the mounting and are connected up to levers on transverse shafts supported by the brackets which support the radiator. The starting shaft of the engine is extended to pass through a bearing on the front port main plane strut, and is worked by means of a crank handle of standard type.

The Napier vaporizer is supported on a bracket high up between the radiator and the engine, the valve operating lever being connected through an extension to a vertical torsion rod which passes down behind the radiator and is fitted with a T-handle.

A low trough-shaped cowling is applied to the engine bearers and fairs in the lower part of the radiator, oil pipes, etc., but the cylinder blocks and manifolds are completely open to the

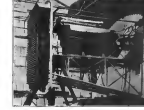


Fig. 4. Engine Installation in the Westland 6-Seater Cabin Airplane

air. The air intakes, of aluminum, are carried down through the cowling, converging toward the center in order to avoid screening by the struts.

The Vickers' wind driven centrifugal gasoline pump, which supplies the power for the fuel system, is located on the rear port main plane strut.

The weights of the various parts of the power plant are —

Engine with turning gear	890 lb
Cooling	275 "
Tanks	78 "
Framework and cowling	75 "
Fuel and oil	577 "
Exhaust manifold, propeller and miscellaneous	170 "
making a to'al of	2,065 lb

or 4.58 lb per b.hp. The fuel economy of this machine is very good. At Martlesham in the Government trials it flew at 82 m.p.h with a fuel consumption of 14.2 gal per hour.

Westland Six Seater Limousine. The engine is installed in an all steel separate tubular mounting, rigidly braced by cable and attached to the front fuselage by ten bolts. The engine is directly bolted to the two main bearer tubes by six bolts, and when in place is very accessible (Fig. 4).

The top and bottom side tubes of the structure are arranged so that their extensions form the support for the radiator. The cowl and cowl frame are independent of and are not supported by the radiator, making the removal of the latter a very simple job.

The whole of the engine installation is separated from the rest of the machine by an aluminum and asbestos bulkhead; in fact, fire prevention has been studied very carefully in this machine. The carburetors, of course, suck from outside the cowling. Two main gasoline tanks are carried, one on each side under the bottom wings, each is fitted with a wind-driven pump delivering the fuel to a gravity tank carried in the front of the top plane, whence the carburetors are fed. None of the pipes enter the main fuselage behind the fireproof bulkhead, the pipes are very accessible and the renewal of the jointing material is much simplified.

The engine fitted in this machine for the government trials was fitted with gearing for a crank handle for starting, but no handle was fitted, the gas starter being relied upon with very satisfactory results. All the controls and the charging pump are placed so as to be get-at-able from the pilot's seat. A hand turning gear is now fitted to these engines for starting from cold in bad weather, keeping the gas starter for favorable conditions and as a very efficient primer in connection with the hand turning gear.

Boulton and Paul ("Lion" Twin-Engine Machine. I am including the description particularly to show the method of dealing with the exhaust designed by Mr. North. This consists of ribbed aluminum casting bolted to the cylinders with steel pipe extension. The ends of the pipes are closed and the gas escapes through narrow slots. This arrangement is quite effective as a silencer, the castings and pipes being in the slip stream are kept surprisingly cool, and this system appears to be work much wider trial.

Aviation Meet at Beverly Hills, Calif.

The Aero Club of Southern California announces that a competition between special racing airplanes, designed and built in California, is to be the leading feature of a two-day aviation meet which will be held on July 16 and 17, the last two days of the Elks' Convention. This meet will be held at the Speedway at Beverly Hills, Calif.

The tentative prize list, which those in charge of the meet intimate is subject to material expansion, calls for $5,000 which will be divided among the winners of probably a dozen different flying events.

At least half of this sum will be awarded to the winners of a special race for local planes, designed and built for and powered exclusively with the familiar and universally popular Curtiss OX-5 engine. To qualify in this event the planes must be capable of attaining a speed of at least 100 m.p.h.

The designs have already been approved and construction started on one of these machines at the shops of the Pacific Airplane and Supply Co. in Venice. Contracts for the second and third planes have not yet been given, although it is understood that they will be signed and construction started by two other local manufacturers within a week or ten days. Other negotiations at present under way point to a total entry list of at least ten locally built racers.

The Army and the Navy will be invited to participate in the speedway program, and it is possible that one of the two days will be devoted exclusively to events for the service aviators.

Admiral Makes Inspection Flight

According to a report received by Captain W. A. Moffett, Director of Naval Aviation, the Commandant of the Naval District including the Hawaiian Islands is now making inspections by seaplane. Recently the Commandant, Admiral W. R. Shoemaker, took passage on an HS-2L flying boat from Pearl Harbor and visited the Islands of Maui and Hawaii. The first leg of the flight from Pearl Harbor to Maui was made without incident and the trip from Maui to Hilo, Hawaii, was made in record time. On the return flight from Hawaii to Pearl Harbor Admiral Shoemaker's plane and another which accompanied it were caught in a strong gale. Despite this, however, the distance of 236 miles was made in 2 hr 30 min.

Another feature of the trip was the fact that constant radio communication was maintained with the seaplanes, enabling the Admiral to carry on routine duty just the same as though he had been in his office at Pearl Harbor.

It is believed that the perfection of radio equipment on seaplanes is now such that inspections of this character will be more and more engaged in by District Commandants and other high ranking officers of the Navy whose command extends over large territories.

The Sperry Commercial Monoplane Wing

As is well known, a remarkably large number of "Jennies" and similar machines is used all over the United States and Canada for various commercial purposes. Although the design of these machines is five or six years old, its inherent qualities are so good and spare parts are so easy to obtain, that many pilots operate "Jennies" in preference to more up-to-date airplanes.

It is with a view to improve the performance of these machines in the light of present aerodynamical knowledge without detracting from their practical features, that the Lawrence Sperry Aircraft Corp of Farmingdale, Long Island, has just placed on the market a standard commercial monoplane wing which is readily adaptable to the Curtiss J.N., Curtiss-Standard and Canadian Curtiss types.

As is shown in the accompanying illustrations of a J.N. fitted with the Sperry equipment, the wing is a thick section

JN Fitted with the Sperry Standard Monoplane Wing

cantilever structure. This is braced to the fuselage by means of four streamlined steel struts which lead from the wing spars to the upper and lower fuselage longerons. Two round steel tubes, acting as drift struts, further connect the front bracing points of the wings with the nose of the fuselage, where they abut against the lower longerons. The whole bracing system thus forms a rigid structure.

The strength of the Sperry cantilever wing has been tested in exhaustive trials flights. The safety factor of the wing is given by the manufacturers as 10.

No information is available on the internal construction of this wing, except that it is an internally braced wooden structure which is covered with fabric in the usual manner and that it embodies inherent stability. Owing to the latter feature and to the raised position of the wing above the fuselage, the manufacturers state that a machine equipped with the Sperry wing will not go into a nose dive, if stalled, nor will it get out of control for any length of time.

The following data, which were prepared by the Lawrence Sperry Aircraft Corp., give the respective performance of five popular types of commercial airplanes when fitted with the Sperry wing:

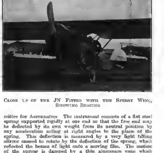
Type of Airplane	High Speed	Landing Speed	Useful Load
JN or Canuck OX	75 m.p.h	35 m.p.h	800 lb
JN or Canuck OXX	80 m.p.h	35 m.p.h	800 lb
Standard J 1 OX	75 m.p.h	35 m.p.h.	800 lb
Standard H. S	90 m.p.h	38 m.p.h	800 lb
Standard Wright 150 hp	90 m.p.h	38 m.p.h	900 lb

The improvement in performances obtained with the Sperry wing, which is particularly noticeable in the low landing speed and in the useful load, is due to the thick wing section employed as well as to the great reduction in parasite resistance which is brought about by the cantilever arrangement. The new wing confers the further advantage of a much better visibility from the pilot's cockpit and greater accessibility for the passengers and pilot. Owing to the absence of the wire trusses and struts involved in a conventional biplane arrangement, which requires much trueing up, the maintenance of a plane fitted with the Sperry wing will also involve much less care and cost on the ground.

Deliveries on the Sperry standard cantilever wings are to begin in the last week of June.

Accelerations in Flight
N.A.C.A. Report No. 99

This report deals with the accelerations obtained in flight on various airplanes at Langley Field. The instrument used in these tests was a recording accelerometer of a new type designed by the technical staff of the National Advisory Com-



Close up of the JN Fitted with the Sperry Wing, Showing Bracing

mittee for Aeronautics. The instrument consists of a flat steel spring supported rigidly at one end so that the free end may be deflected by its own weight from its neutral position by any acceleration acting at right angles to the plane of the spring. This deflection is measured by a very light tilting mirror caused to rotate by the deflection of the spring, which reflected the beams of light onto a moving film. The motion of the spring is damped by a thin aluminum vane which rotates with the spring between the poles of an electric magnet. Records were taken on landings and take-offs, in loops, spins, spirals and rolls. It was found that the loading in a fairly heavy landing reached a maximum of 5 g., in a loop it reached a maximum of about 3.7 g., in a spin a maximum of about 3 g., while in a roll it attained the value of 4.2 g., showing that this maneuver puts a greater strain on the machine than any other. A JN-4H was pulled as suddenly as possible out of a dive at 50, 60, 70 and 80 m.p.h. The records show that the time elapsed between pulling the stick back and reaching the maximum acceleration was independent of the air speed and amounted to about 0.9 sec. These accelerations are slightly lower than the theoretical accelerations that would be obtained if the machine were suddenly turned to the angle of maximum lift.

It was also found that an airplane had a certain definite period of vibration which could be excited by the engine, but which was not at all dependent upon it, as the vibrations were nearly as evident when the machine was gliding with a dead stick. This period of vibration appeared to be inversely proportional to the weight of the machine. It is concluded from these tests that in no reasonable stunting would the load in flying ever exceed a factor of four and one-half times the normal stress.

A copy of Report No. 99 may be obtained upon request from the National Advisory Committee for Aeronautics.

"Who's Who in American Aeronautics"

Every week, AVIATION AND AIRCRAFT JOURNAL prints the biographical sketch of men who are prominent in American Aeronautics. These sketches will be published later in pamphlet form. As so many of the officers change their stations often, it is believed that a semi-annual issue will be necessary. In compilations of this character many errors and omissions occur. It will be appreciated if corrections are sent to "Who's Who" Editor.

Henry William Harms

HARMS, HENRY WILLIAM Major Air Service born Wentworth S D Nov 25 1887 son of Adolph Harms and Sophia Harms married Enid Leslie May 29, 1919

Educated Wentworth Grammar School 1902 Madison High School 1906 one year C E University of Minnesota, 1907 U S Military Academy 1912 Aeronautical Engineering Course M I T 1916-1917

Professional 4 years Cadet U S M A 2½ years, U S Cavalry 5½ years Air Service

Aeronautical Activities Jan 1915 to June 1915 flying instruction aviation school San Diego, Calif July 1915 to Aug 1915 flying duty 1st Aero Squadron Fort Sill Okla Sept 1915 flying duty 1st Aero Squadron Brownsville Tex. Oct 1915 to March 1919 course in aeronautical engineering Mass Inst of Tech April 1919 to June 1919 inspection duty Curtiss Airplane Co Buffalo, N Y July 1916 to Oct 1917 duty in Aviation Department, Office C S O Washington, D C Nov 1917 to Jan 1918 Engineering Division Air Service Headquarters A E F France Feb 1918 to Feb 1919 Engineering Division Air Service Headquarters A E F England March 1919 to March 1920 Engineering Division Air Service McCook Field Dayton Ohio April 1920 to date Engineering Division Representative Office Chief of Air Service Washington D C

Flying Rating Junior Military Aviator 1915 Aero Club of America 1918 Military Aviator 1920 Airplane Pilot

War Service Air Service O C A S April 1917 to Oct 1917 Air Service A E F Nov 1917 to Feb 1919 Air Service Eng Div 1919 to date

Member Society of Automotive Engineers Aero Club of America Army and Navy Club (Wash) Columbia Country Club (Wash)

Present Occupation Engineering Division Representative O C A S

Address Air Service home The Chastleton Apts 16th and R Street N W Washington D C

Elliot White Springs

SPRINGS ELLIOT WHITE Manufacturer born Lancaster S C July 31 1896 son of Leroy Springs and Grace (White) Springs

Educated Asheville School Culver Military Academy A B 1917 Princeton University

Professional Left College to go to Army went to work in Cotton Mill after discharged in 1919 later made Secretary and Treasurer of Kershaw Cotton Mills later promoted to Lancaster Cotton Mills, Lancaster S C 1920

Aeronautical Activities Began flying at Princeton in April 1917 flew with American and British at the front was in New York Toronto Race in 1919 American Ace Officially credited with the destruction of 12 enemy airplanes

Flying Rating Military Aviator 1918 received British Pilot Certificate

War Service U S Air Service 1917 1919 attached R A F 1917 1918 served with 85th Squadron R A F and 148th U S attached R A F as Flight Commander

War Honors Distinguished Service Cross Awarded D F C

Present Occupation Cotton Manufacturing

Address Lancaster S C

Frank L. Morse

MORSE FRANK L Manufacturer born Ithaca, N Y Sept 14, 1864 son of Ben Morse and Sarah (Fitchette) Morse married Cora Perry, April 7 1910

Educated Public schools, Ithaca, N Y

Professional Manufacturer since 1890 executive

Aeronautical Activities President of Thomas Morse Aircraft Corp Manufacturers of airplanes and aeronautical engines

Member Engineers Club (N Y) Detroit Athletic Club A S M E Society of Automotive Engineers Town and Gown Ithaca N Y Country Club of Ithaca University Club of Ithaca.

Present Occupation President, Morse Chain Co President, Thomas Morse Aircraft Corp

Address South Hill home, "Green Trees" Ithaca, N Y.

Gerald Clark Brant

BRANT GERALD CLARK Major Air Service born Chariton Iowa June 28 1880 son of Clark Thompson Brant and Ella (Molson) Brant married Ethel Frey Ludlow, [illegible] 17 1914

Educated High school 189[illegible] U S Military Academy 1904

Professional Cadet U S Military Academy 1899 1904 2nd Lieut 9th Cavalry 1904 1st Lieut 10th Cavalry 1911 Capt 7th Cavalry 1916 Major Cavalry 1917 Major Aviation Section Signal Corps 1917 Lt Col Aviation Section Signal Corps 1918 Col Air Service 1918

Aeronautical Activities Reserve Military Aviator Course at Kelly Field 1917 Junior Military Aviator Course at Rolling Field 1918 flew from America [illegible] Dallas Tex from [illegible] to New York City from New York City to Montreal from New York to Toronto from New York to Boston participated in New York Toronto Race 1919 and New York San Francisco Race 1919

Flying Rating Airplane Pilot

War Service Adj 2d Brig Kelly Field 1918 Executive Officer Southern Training Department 1918 C O Kelly Field No 2 1918 Chief Operations and Asst Director Military Aeronautics Washington D C 1918

Member Army and Navy Club (Wash) Aero Club and Camp Fire Club (N Y) Archer Club Bornel

Present Occupation Detailed Ft Leavenworth School

Address Fort Leavenworth Kans.

Vincent J. Buranelli

BURANELLI VINCENT J Aeronautical Engineer born [illegible] son of V J Buranelli [illegible] Buranelli

Educated [illegible] Tex Monterey Mex [illegible] schools St Peters [illegible]

Professional [illegible]

Aeronautical Activities 1912 experimenting with Gliders until [illegible] 1912 built exhibition plane with some associate designed plane for ABC Exhibition Co designer International Aviation Co 1916 eight months conducting wind tunnel experimenting Washington D C Chief Engineer and Superintendent Continental Aircraft [illegible] designed aerial torpedo plane designed plane for the Brazilian Govt 1918 in charge landing gear production for spares for different types of planes learned to fly in 1919 long cross country trips in the west Chief Engineer and Factory Superintendent Lawson Airplane Co Milwaukee Wis in charge of Lawson Airliner during Construction and Chief Engineer on Cross Country trip 1920 Chief Engineer and Superintendent Nebraska Aircraft Co Lincoln Nebr 1921 engaged in designing a 30 passenger plane of original type for Airliner Engineering Co

Member [illegible]

Address [illegible] home South French Ave Temple Tex

James Barbour Rixey

RIXEY JAMES BARBOUR Attorney at Law born Brandy Sta Va March 1 189[illegible] son of John Franklin Rixey and Ellie (Barbour) Rixey

Educated Force School Washington D C Jefferson School Charlottesville 1912 1913 Hampden Sidney College 1913 1917 University of Virginia LL B Bachelor of Arts 1919 1920, University of Virginia

Professional Practicing law since Sept 1920

Aeronautical Activities Enlisted May 1917 at Ft Myer Va transferred in July 1917 to Princeton Ground School sent to Mineola L I Sept 1917 commissioned Dec 14 1917 transferred Gerstner Field Jan 1918 helped organize the Aerial Gunnery school at Gerstner Field sent to Dorr Field as Officer in Charge Air Section Aerial Gunnery School June 1918 discharged Dec 1918 at Mineola as Aerial Gunnery Officer of the First Provisional Wing 1st Lieut S R C

Flying Rating 1920 Reserve Military Aviator

War Service Army May 1917 to Dec 1919

Member Aero Club of America

Present Occupation Attorney at Law

Address 404 Cove St home 1500 Colonial Ave Norfolk Va

Harry Bowers Mingle

MINGLE HARRY BOWERS Lawyer born Lock Haven Pa April 18 1868 son of Sampson Quiggle Mingle and Rosanna (Bowers) Mingle married Millicent Brown Dyer June 5 1909

Educated Dickinson Seminary Williamsport, Pa 1889 B S in Economics University of Pennsylvania 1902 LL B New York Law School

Professional Since 1899 has been continuously engaged in law practice specializing upon Corporation law between 1899 and 1913 was organizer incorporator and director of the Depew and Lake Erie Water Co the Western New York Water Co and Lake Ontario Water Co at one time was president of these companies was incorporator and director of the Cochrane Land Co and the Cranford Development Co director of the State Trust Company of New Jersey

Aeronautical Activities 1916 acquired an interest in the Standard Aero Corp and afterward was made its president out of this company grew the Standard Aircraft Corp was president and one of the organizers of Aircraft Manufacturer's Association later this was merged into the Manufacturers Aircraft Association

Member University Clubs of Philadelphia and Washington Lawyers Club Lotos Club Graduates Club of New York Delta Upsilon Club General Alumni Society of University of Pennsylvania American Bar Association State Bar Association Essex County Country Club Orange Lawn Tennis Club Aero Club of New York Society of Automotive Engineers Academy of Political Science Pennsylvania Society

Present Occupation Lawyer

Address 213 Broadway New York City home, Llewellyn Park West Orange N J

Ira A. Rader

RADER IRA A Major Air Service born, Marion Calif July 30 1887 son of Isaiah Rader and Josephine (Scott) Rader married, Alice Kent March 15 1917

Educated California grade schools 1905, Alameda High School one year University of California June 1911 U S Military Academy

Professional 2nd Lieut 19th Infantry June 13 1911 1st Lieut Infantry 1916 Captain, Infantry 1917 Major Aviation Section Signal Corps 1917 Lt Col (temp) Air Service 1919 Major Air Service July 1 1920

Aeronautical Activities Graduate S C Aviation School San Diego Calif 1915 pilot, 1st Aero Squadron during Punitive Expedition in Mexico 1916 has flown all types of American planes

Flying Rating Junior Military Aviator 1915, Military Aviator 1918

War Service Commanded 7th Aviation Instruction Center A E F (bombing school) at Clermont-Ferrand France Nov 1917 to Sept. 1918 attached to Day Bombardment Group, A E F during St Mihiel and Meuse-Argonne attacks, 1918

Member Various service clubs Aero Club of Omaha

Present Occupation Major Air Service

Address Fort Crook Nebr

Edgar G. Tobin

TOBIN EDGAR G Automobile business born San Antonio Tex Sept 7 1899 son of William Tobin and Ethel Tobin

Educated West Texas Military Academy

Professional Bank clerk during 1915 Insurance from 1915 to April 1919 now sales manager for The Crockett Auto Co

Aeronautical Activities American Air Service from April 1919 to Sept 1919 American Ace officially credited with destruction of 9 enemy airplanes

Flying Rating Junior Military Aviator

War Service With French in Escadrille Lafayette from March 10 1917 to July 1 1918 then with 3rd Pursuit Group to the end of the war

War Honors Croix de Guerre Distinguished Service Cross

Present Occupation Sales Manager for Hudson and Essex Automobile Distributor

Address Roman and Oakland Sts , home, 511 St. Marys St., San Antonio Tex.

Lessons of the Gordon Bennett Race, 1920

By W. Margolis

Aerodynamical Expert, Paris Office N. A. C. A

In this Paper I propose to give briefly the characteristics of all the airplanes built for this race, with some new details concerning the French machines, to study the airplanes from an aerodynamical point of view; and lastly, to say a few words on the regulations of future speed tests.

Airplanes Taking Part in the Cup Race

(1) NIEUPORT (Sadi Lecointe).

DIMENSIONS — Span 6 m ; length 6 m. 20, height 2 m. 50, wing chord 1 m 20, aspect ratio 5, mean gap 1 m. 35, lifting surface 12.3 sq m , ailerons 1 23 sq m., tail plane 1.25 sq m., elevator 0 75 sq m , fin 0 44 sq. m.; rudder 0.45 sq m.

WEIGHTS — Airplane without engine 300 kg., engine set 390 kg ; pilot 80 kg ; fuel 100 kg., total weight 870 kg 7 07 kg /sq m., 2 68 kg /hp.

PROPELLER — Type Chauvière, diameter 2 45 m., pitch at ¾ of radius 2 80 m ; maximum width 0 20 m.

ENGINE — Hispano-Suiza 300 hp Full speed, 1980 r p m., corresponding to 320 hp Compression 4 9 Lamblin Radiator, 25 sq m. radiating surface

(2) SPAD-HERBEMONT (de Romanet)

DIMENSIONS — Span 6.5 m ; length 7.3 m ; height 2.5 m., wing chord 1 22 m , aspect ratio 5 3; gap 1 25 m ; surface 13 1 sq. m.; ailerons 1.2 sq m , tail plane 1.1 sq. m ; elevator 0 9 sq m , fin 0 35 sq. m , rudder 0 4 sq m

WEIGHTS.— Airplane without engine 320 kg , engine set 390 kg ; pilot 80 kg ; fuel 100 kg , total weight 890 kg. 68 kg /sq. m.; 2 7 kg /hp

PROPELLER — Type Lumière, diameter 2 4, pitch at ¾ of radius 2 9 m , maximum width, 0 25 m.

ENGINE — Hispano-Suiza 300 hp At 2000 r p m 330 hp ; Compression 4 7 Honeycomb radiator 30 sq m

(3) THE BOREL-BOCCACCIO†

DIMENSIONS — Span 7 1 m ; length 7 1 m , height 2 4 m., wing chord 0.90 m ; aspect ratio 8, gap 1 1 m., surface 13 sq m , ailerons 1.1 sq m.; tail plane 1 3 sq m., elevator 1 sq m.; fin 0 4 sq m ; rudder 0 5 sq. m

WEIGHT — Airplane without engine 290 kg; engine set 380 kg., pilot 80 kg., fuel 100 kg ; total weight 850 kg. 65 kg /sq. m ; 2 5 kg /hp

PROPELLER — Lumière, diameter 2.5 m., pitch at ¾ of radius 2.9 m., maximum width 0 20

ENGINE — Hispano-Suiza 300 hp. At 2050 r p m 335 hp.; Compression 4 7, Lamblin radiator, 25 sq m
radiator, 25 sq m

It will be noticed that this airplane has a small wing chord and large aspect ratio (8), while the other machines had a mean aspect ratio of 5 Considering that a racing plane should fly very close to its ceiling, the increased aspect ratio seems logical. But on the other hand, when we calculate the value of K_r we see that it is very low and as we know that increase of aspect ratio does not appreciably diminish resistance at low lift, we may ask whether it was advisable to adopt a large aspect ratio. We are unable to decide the question one way or the other, for as we shall see further on, a reduction of area of the Nieuport led to a reduction of speed, which is contrary to what might have been expected

(4) THE MARTINSYDE

Span 6.15 m.; length 5.85 m.; height 2.2 m.; surface 13 65 sq m ; total weight 920 kg Hispano 300 hp. engine.

(5) THE DAYTON WRIGHT

DIMENSIONS — Span 6 9 m., length 6 0 m.; height 2 44 m , maximum wing chord 1 98 m , minimum wing chord 1 22 m., mean aspect ratio 4.3, maximum thickness 0.14 m , surface 9 6 sq m.; ailerons 2 4 sq m ; tail plane 1.36 sq. m.; elevator 0 8 sq m

WEIGHTS — Empty 638 kg ; loaded 841 kg. 87 6 kg /sq. m., 3.37 kg /hp Engine, Hall-Scott, 6 vertical cylinders, 250 hp ; propeller 2.2 m. in diameter

The question arises whether it is preferable to have a monoplane with an aspect ratio of 4 3 or a biplane with an aspect ratio of 8

(6) THE VERVILLE

DIMENSIONS — Span 8.58 m , length 7 36 m.; height 2 64 m., maximum chord of upper wing 1 8 m , minimum chord 1 05 m , mean aspect ratio 6, surface 21 3 sq m., ailerons 1 72 sq. m.; tail plane 1 7 sq m.; elevator 1.5 sq m., rudder 0 9 sq m.

WEIGHTS — Airplane without engine 500 kg.; engine set 610 kg ; fuel 245 kg ; pilot and miscellaneous 95 kg ; total weight 1450 kg ; 68 kg /sq m. 2.6 kg /hp Engine, Packard 550 hp

Aerodynamical Information Gained by the Contest

This is based on the following logarithmic polars

(1) The polar curve of the Borel-Boccaccio model airplane from the tests made at the St. Cyr Aerotechnical Institute.

(2) The straight line indicating the conditions of flight near the ground level of the same machine, by the flight made in the elimination tests

(3), (4) and (5) The straight lines indicating the conditions of flight of the Nieuport, Verville, and Dayton-Wright airplanes.

(6) The polar curve, according to the tests of the French S T Aé , of the Nieuport pursuit monoplane, from which is derived the Nieuport racer. (Weight, 110 kg , area 27 sq. m., Hispano 300 hp)

(7) The straight line indicating the conditions of flight of the Deperdussin airplane of the Gordon Bennett cup race of 1913 (Weight 740 kg ; area 10 sq. m.; Gnome 160 hp)

From an examination of these data the following conclusions may be drawn

1 The laboratory test gives for the Borel-Boccaccio a resistance of 50 per cent greater than the true resistance. This is due to the fact that in tests made in existing laboratories, the Reynolds number realized is from 15 to 25 times less than that of the plane in free flight, and that, consequently, the struts of the rigging and undercarriage have a resistance on the model five times as great as on the full scale machine, while the increase of resistance for the other parts of the machine vary between 100 and 200 per cent. If the Reynolds number involved is rather high, it is perfectly useless to test a model in an existing laboratory

2. The classification of the Borel, Nieuport, Spad and Verville machines seems to be quite logical when we consider that the resistance of the Nieuport was greater than that of the Borel because it had an additional cabane, that the resistance of the Spad was greater than that of the Nieuport because of its radiator placed forward‡, and the Verville having the same load per horsepower and per square meter as the other

* Technical Note No 90 N A. C A (Excerpt)

† This machine would have qualified in the French elimination trials had not the pilot failed to pass between the pylons at the start.

‡ The Spad has lately beaten the speed record (309 km /hr) by almost entirely masking the radiator with a large pan-shaped screen and suppressing the wind-screen of the cockpit, the pilot's seat being moved further back in the fuselage

machines and being of the same type, there was no reason why it should fly faster than the others.

3. I must make some remarks on the shape of the Dayton-Wright wing. It is known that this wing, in one of the extreme positions, is hemonvex. Now, in 1916, at the Eiffel Laboratory, we tested a wing identical to the Dayton-Wright, that is it was composed of three parts hinged together. These tests showed that if we plot the envelope of the polar curves obtained with different positions of the leading and trailing edges and if we consider the range of speeds between K_y = 0.0205 and K_y maximum, we see that this envelope practically coincides (with an increase of 5 per cent in landing speed) with that of a *rigid* wing with a camber of 3 per cent.

The Dayton-Wright wing would only be advantageous for an airplane with a very high ceiling, which was required to fly at high speed near the ground level, but it is not advantageous for a racer which must fly as near its ceiling as possible. If we wish to have a low landing speed, we must have a slightly concave ventral profile while keeping a variable camber.* But we shall do still better to make an ordinary wing of slightly larger area, doing away with all of the superstructure of controls which absorb quite an amount of power.

There is still much to be criticized in the Dayton-Wright, and that is regrettable, for it was the only machine offering new features and its production had cost an amount which, to European ideas, appears enormous.

4. When we compare the Pursuit Nieuport with the Racing Nieuport, we find that the reduction of resistance is not due merely to reduction of surface, but also to a great decrease of passive resistances or, more probably, to a decrease of the coefficients of resistance with speed.

5. The comparison of the Deperdussin with present-day airplanes shows the great progress made, not as regards the power of the engine, but as regards the forms of the machines.

6. Attention should be drawn to the low value of K_y = 0.01, corresponding to flight at full speed near the ground level of the airplanes competing for the Cup. This low value leads to the assumption for these planes of a rather high ceiling, of the order of 6000 m.

From this we might conclude that the speed of the airplanes could be still further increased by reducing the area, but this is not so. The Nieuport of Kirsh, which had 13 sq. m., flew faster than Sadi Lecointe's machine with a surface of 12 sq. m., and I know that a test which Sadi Lecointe made with one of 11 sq. m., lowered the speed by 30 km./hr.

It is true that the surface was reduced by clipping the end of the wings, so that the aspect ratio was reduced, but none the less, considering the low value of K_y, we cannot account for this reduction of speed.

Perhaps the systematic free flight tests now being made by Mr. Boccaccio on his airplane, may throw some light on the subject.

Reflections on Future Regulations for High Speed

Now that France has definitely won the Gordon-Bennett Cup, people are wondering how future high speed tests will be regulated. Many are those who think that it is time to set as was done in automobile races, and abandon the formula of absolute liberty under which the Gordon-Bennett Cup was contested, imposing certain restrictions on the machines, though they will still be classified according to speed. Especially it has been suggested either to limit the power of the engine, the load per square meter of the machine, or to fix a minimum landing speed.

Personally, I think that perfect liberty should be allowed, and this for the following reasons:

1. In order to increase speed, it is not sufficient to increase engine power; the Verville, with a 550 hp. engine, did not fly any faster than the Nieuport, for the two machines had the same load per horsepower and per square meter and certainly the structural resistances of the Verville (very large fuselage, large undercarriage) were in the same ratio to those of the Nieuport as the power of their respective engines. The Verville weighed almost twice as much as the Nieuport: 1450 kg. for the former and 870 kg. for the latter.

A machine, however, which might have beaten the French Nieuport, was the English Nieuport with an A. B. C. engine of the same power, but which allowed of a more harmonious fuselage without radiators and a gain of 70 kg. in weight on the engine set.

In the present state of things, liberty as regards engine power does not lead to a search for the most powerful engine, but for one which is reliable and light; *it thus leads to progress.*

2. As already remarked, an increase in the load per square meter does not necessarily lead to increase of speed; this is an inexplicable fact, but it is a fact. As the optimum load per square meter, which, for the Nieuport, seems to be 67 kg./sq.m., does not lead to dangerous landing speeds, there is no reason, for the present, why it should be limited. Those who watched the contesting airplanes in the Gordon-Bennett Cup land, had never for an instant the idea of danger. We must not forget that the load per square meter is constantly increasing, not only for military airplanes, but also for commercial machines. The Morane machines, the Gourdou-Leseurre, the Dornier-Zeppelins, the latest Zeppelin monoplane (Staaken), are loaded at 50 kg./sq.m.; all these, it is true, are monoplanes: we must then define the load of machines according to the number of planes, and that seems much too complicated and above all useless, considering our present uncertainty as to the influence of the unit load on speed.

3. It would be well to fix a minimum landing speed, but we must first know how to measure this speed. Many people think it should be measured by the minimum speed of the airplane. Let us remember the "greatest range" competition organized by *Auto* last summer. Machines landed at 29 kg./sq.m. flew at 33 km./hr., which leads to admitting for biplanes kg.=0.12 kg./sq.m.-sec.; (or kg.=0.24 lb./ft./m.p.h.) values which might well excite the envy of even a Handley Page wing.

Unfortunately, there is another explanation of the fact, there was a light side wind blowing, and the Farman pilots, well drilled in such exercises, flew sideways when there was a head wind, so that the outward bound journey was accomplished, say, in 10 min., and the return journey in 2 min.

Thus, this question cannot be regulated by any set of reasoned regulations, since it is a question of atmospheric conditions and of skill on the part of the pilot. In short, in the present state of affairs, I think that liberty will lead more surely to progress than any regulation can do.

The British Air Mission to Japan

Owing to the refusal of the British government to permit a regular R. A. F. mission to go to Japan to train the Japanese Naval Air Service, an unofficial mission has been formed and most of the members thereof are now on their way across the United States or are on the Pacific enroute for Japan.

The organizer and commanding officer is Colonel the Master of Sempill, who is probably as well known in and known as much of the United States as any R. A. F. officer. His second in command is Major Bernard Fowler, who has been flying since 1910, and founded the Eastbourne Aviation Co., Ltd., and the Eastbourne Aerodrome. Major Fowler is O. C. all flying operation and instruction, and he is known here as one of the best instructors in the R. A. F.

The O. C. ground organization, as opposite number of Major Fowler on the flying side, is Lieut.-Col. Mears, who did excellent organizing work in the R. A. F. during the war. Furthermore Colonel Mears knows the Far East intimately, and probably knows the road from Pekin to India as well as does Sir Frederick Sykes. Though China and Thibet have little at present to do with Japan, one never knows when Col. Mears' experience of the Oriental and his ways may come in useful either to his new employers, or to the British Mission when war with America draws near.

With these officers are a number of highly skilled pilots and engineers, as well as mechanics, so that it should be capable of doing excellent work, and should build up a very nice little Naval Air Service for Japan before the outbreak of war, always provided that enough Japanese can learn to fly, which is the great difficulty at the moment. However, if the Japanese do not make good pilots they can always equip their Air Service with inherently stable airplanes and with automatic control gadgets.—*The Aeroplane.*

* We have been informed that the Curtiss of the Cup Race, which was also very heavily loaded per square meter, substituted, after tests, a profile with flat lower face for the concave profile first adopted.

Chemical Warfare in Future Wars

The Chemical Warfare Service has made plans for participation in the bombing experiments in June. Chemical warfare as now understood comprises the use of poison gas, smoke and incendiary material by all the combat branches of the army. Poison gas not only includes those gases which kill by inhalation, those which penetrate the skin and go to the brain centers, but those which remove soldiers from active participation in a battle by causing sneezing, vomiting or temporary irritation to his eyes. Smoke has its use in permitting Infantry to advance over open places; tanks to get into contact with the Infantry through the cover of the smoke screen, the concealment of flanks, the blinding of the enemy posts of observation; the blinding of machine gun nests; deceiving feints to cause the enemy to expect attacks in various other localities than where the main advance is to be made, the concealment of military construction work such as the building of pontoon bridges, the erection of entrenchments, etc. Incendiary material will cause fires among the enemy's military stores and supplies.

Aircraft Bomb Exploding
Courtesy U S Naval Institute

The question now arises whether in future wars, it may become an international policy to prohibit the use of warfare gases It would be better to approach this question as to whether it is possible to prohibit the use of these gases. To prohibit the use of a gas in war means the abolition of the chemical industries over the country, which is evidently an impossibility. Efficient chemical warfare depends upon the peace time developments of the chemical industries of the nation. These industries can be transformed instantly into producers of warfare gases. Research work can be carried on in peace time so thoroughly concealed that a modern nation will have means of offense and defense in warfare gases far beyond those known to have prevailed at the end of the World War

Chemical warfare as used by the Germans against the Americans from July to November 1918 caused 30 per cent of the American casualties with about 10 per cent expenditures of ammunition. Of these casualties, 1 per cent were fatal and so far as known at present, scarcely 1 per cent of the remainder suffered any permanent consequences from being gassed This cannot be said of the deaths and maiming caused by artillery shell fire.

With such an efficient weapon at hand, and the evident impossibility of limiting its development in peace time, it is unreasonable to suppose that any nation in a new World War will abandon the use of gas warfare when that nation's very existence depends upon the success of the conflict.

Chemical munitions are delivered upon the enemy by artillery, aviation, special gas troops and by infantry. The artillery gas shell is lighter than the high explosive shell. The range of artillery and rapidity of firing have almost doubled since the days of 1914 These factors make possible the delivering of large quantities of gas upon the enemy front lines, upon the lines of communication and upon the troop concentrations, railroad terminals and supply depots far in the rear. When an artillery high explosive shell detonates and its effect is lost two seconds later, an artillery gas shell leaves its effect from 15 minutes to 8 days. The consternation caused among troops upon the arrival of gas at night, is greater than that produced upon their morale by even a high detonation of large calibre artillery shells. In the next war, one may expect to see billets, road crossings, rest areas, transportation centers and roads of communication constantly and thoroughly covered with deadly or harrassing warfare gases.

The aviation now carries and drops bombs of one ton size. In place of imagining a squadron of eighteen planes, conceive of a fleet of two or three hundred planes delivering the same number of tons of gas upon the enemy The very protection this enemy must adopt against this gas, will hamper his movements, will decrease his efficiency and by his decreased offensive powers, an increased gain of defensive protection is to be had by the side which delivered this attack. The quickest ending of a modern war is caused by the destruction of a nation's production facilities. The flight of the future airplane will cover geographical areas which include the heart of any nation's geographical plants. If by the use of warfare gas, these plants may be put out of action and the war brought to a sudden end, is it probable or not that aviation will be called upon to deliver large quantities of gas on industrial centers?

The present carrying capacity of planes will probably be multiplied many times within the next ten years In fact, the limit to their size will be fixed by the considerations which stop the development of the dreadnaught and ocean grayhound. In place of planes carrying one ton of gas, we will probably find planes carrying twenty tons and with a squadron of one hundred planes, it is easy to see the drenching a large area might be given Gas may not only be dropped in these large tank bombs from planes, but these same tanks may release the gas by method of spraying and the gas itself, fall as vapor or as rain drops. Greater dispersion can be had by this method and therefore, large areas may be gassed efficiently

Coast fortifications may be expected to be drenched by gases both from naval attacks and from aviation. In return the bombarding ship will receive armour piercing gas filled projectiles. The gas will be driven through the ship by the forced draft necessary for the ventilation of naval vessels

Here a type of gas will be used against which the crews of ships will have to be protected by heavy clothing impregnated with certain chemicals, protective gloves, masks and head gear. The reduction of efficiency in the fighting value of a naval vessel compelled to adopt such methods becomes a matter of serious moment. Aviation smoke bombs will not only blind the movements of a fleet, but permit the planes themselves to fly low enough to deliver their rain of bombs with a certainty of success.

Weapons used by the special gas troops have had their weight cut in half by post war developments, their ranges doubled and the quantity of gas to be delivered trebled. This means the drenching of the entire front areas to a depth of at least three miles by a constant rain of various gases. It means armies will have to be taken out of gassed areas to eat, that animals if used, will have to be given the same protection given the men, that no time during night or day, may the man put aside his protective equipment. The very metal of his fighting weapons will be corroded and made useless by the action of the gases. Nervous reaction is bound to occur. The side putting over the greatest offensive, will find the weak places in the line. Certain warfare gases are placed in containers under high pressure. When these containers are opened the liquid gas turns to a vapor and rushes forth to be carried by the wind fifteen or twenty miles from the point of emission. This has already occurred. Its efficiency is increased by the volume released and the rapidity with which this volume can be brought to the place of release. The British used motor lorries with gas cylinders toward the end of the war. Probably five ton trucks will replace these and tons of gas will be brought from the rear to favorable points at the front with the speed of the modern high powered motor truck.

There are several hundred thousand known chemicals and several million known combinations of these chemicals. Research chemists realize that there still remain tens of millions of combinations yet to be made. Some one of these combinations is going to produce an odorless, colorless and tasteless gas which with certain modifications will cause temporary casualties or instant death and which by already known methods, can be given a persistency at will of from 15 minutes to 8 days, depending upon the tactical occasion. Such a gas must penetrate the ordinary clothing, must require special protection in the canister of the gas mask and will also require specially impregnated uniforms to protect soldier and civilian worker from the gas clouds of the future. Knowledge of this type of gas by one nation and ignorance of its action by another, means victory for the nation which has prepared and victory in a very short period of time.

THE PULITZER TROPHY RACE COMMITTEE, AVIATION COUNTRY CLUB OF DETROIT. LEFT TO RIGHT, SITTING: W. E. METZGER, COL. J. G. VINCENT, C. T. BUSH, COL. S. D. WALDON, FRED LOVELL; STANDING: W. B. STOUT, W. WALKER, E. P. HAMMOND, W. LERCHEN

Book Review

PILOTS' DIRECTIONS, NEW YORK—SAN FRANCISCO ROUTE. United States Air Mail Service. (Government Printing Office, Washington, D. C.)

A very complete book of directions for pilots on the New York—San Francisco mail route has been prepared under supervision of Hon. Otto Praeger, former 2nd Asst. Postmaster General, with the cooperation of pilots and supervisory officials of the Air Mail Service and with the assistance of the postmasters located within five miles of the line of flight. All employees of the Air Mail Service will be required to familiarize themselves with the information relating to the section of the route with which they are concerned. This work may well serve as a foundation for a series of indexed air routes eventually covering the whole country.

A criticism of this book might be made, that there is a lack of direct coordination with the maps. But there is such a thing as making it too easy for the pilot, thereby encouraging him to slight his own preparations. On the other hand, if he must himself check up his landmarks on the maps before starting a flight he is at the same time learning the route most effectively. In air navigation there is no substitute for careful planning and constant watchfulness on the part of the pilot. Hence, the Air Mail handbook should not be considered as a labor saving device but rather one to enable the pilot to work to better advantage.

The subheads in the handbook read: Distances, Landmarks, Compass Course, Emergency and Regular Landing Fields, with service and communication facilities at principal points on route.

Perhaps the clearest idea of the scope of the book will be given by the following abstracts from the first route, New York to Bellefonte:

Hazelhurst Field, Long Island.—Follow the tracks of the Long Island Railroad past Belmont Park race track, keeping Jamaica on the left. Cross New York over the lower end of Central Park.

Newark, N. J.—Heller Field is located in Newark and may be identified as follows: The field is 1¼ miles west of the Passaic River and lies in the V formed by the Greenwood Lake Division and Orange branch of the New York, Lake Erie and Western Railroad. The Morris Canal bounds the western edge of the field. The roof of the large steel hangar is painted an orange color.

For this pioneer work, great credit is due to Mr. Praeger and others who have worked on the book for initiating what will probably be a classical method of giving route directions to pilots.

Trade Notes

The Oliver Profiler

A pamphlet of the Oliver Instrument Co., Adrian, Mich., describes a Profiler for producing irregular shaped metal parts, which may be of real service in the construction of sheet metal airplane parts. The machine allows parts to be produced without the use of dies. It is built on the lines of a punch press, with a deep throat and a very short stroke, with a specially constructed punch and die.

OLIVER PROFILER

A template is first made to the exact shape of the part desired. This template can be sawed out and finished very quickly with an Oliver Sawing Filing and Lapping machine. This template is doweled or clamped to a piece of the sheet metal of the thickness desired and the excess metal cut away by the punch. The work is easily guided, making it possible to cut out intricate patterns with ease and accuracy.

The stroke is so proportioned that the punch clears only the stock and cuts into the metal until the template rubs against the body of the punch. The work is guided by hand, keeping the template against the punch until the entire outline has been cut.

There is an eccentric bearing in the head by means of which the punch can be raised ⅜ in. When in this position, the work will pass under the punch and can be set in position to work out interior cuts. It is impossible to over-run the finished outline and the work comes from the machine practically finished. It is only necessary to remove, by filing, the small marks left by the punch. This machine is motor driven and has an inter-locking switch and brake arranged in such a way that the machine runs only so long as the foot is on the pedal.

The speed is 250 strokes per minute. The punch removes about 1/16 in. material at each stroke. The stroke is ¼ in. and the machine will work steel up to 5/32 in. thick or 3/16 in. thick of softer metal.

In the price list types of the Sawing, Filing and Lapping machines are also described. These avoid the making of dies and templates by tedious hand processes and are useful in all manner of shop work.

Rohde Laboratory Supplies

The catalogue issued by the Rohde Laboratory Supply Co. is a volume of 333 pages, with many cuts illustrating different types of apparatus. The company specializes in apparatus and equipment for biological, bacteriological, chemical, physical and metallurgical laboratories.

Apparatus of every type is suitably illustrated by diagrams or photographs and quotations are given on every article. To anyone equipping or maintaining the equipment of a chemical metallurgical or materials laboratory, this catalogue should be a mine of information and inspiration.

A standard Brinell machine for determining hardness of metals is listed. This is a complete machine with automatic weight control to insure correct test loads independently of the accuracy of the pressure gage, with 3000 kg. maximum test pressure, with twelve special balls of 10 mm. diameter.

A very interesting machine is a complete universal wearing testing machine for metals and alloys—applicable particularly to materials used in engine construction—for tests on rolling or sliding surfaces, dry or lubricated, under variable speeds and pressure. In selecting suitable alloys and determining their most effective heat treatment to resist abrasion or "wear". It has often been assumed that the harder the material, as examined by the customary hardness tests, the greater should be its resistance to such forces. However, it has recently been definitely established that there is no relation between the property we call "hardness" of metal and its wear-resisting qualities. In this machine the tests are made by using disc specimens, which rotate in pure rolling or sliding action against each other's edge. The wearing effect on the specimens is produced by simultaneous rotation alone, or by rotation combined with friction, or by friction only. The machine is fully equipped with the necessary dynamometric devices to measure the force developed and work performed during a test. The testing conditions can be varied within wide limits.

The makers also list other interesting machines for material testing, such as the Humfrey static notched bar testing machine for the quantitative measurements of the brittleness and ductibility of steel and other metals.

For fatigue investigations the Eden-Foster repeated impact testing machine is listed. In the design of a machine for testing by repeated impact several considerations must be taken into account if the results of tests are to be interpreted accurately. It is essential that the true energy of the blows should be calculable if various results are to be truly comparable. In some designs hitherto used these conditions have not been strictly fulfilled, the hammer had attachments and some doubt always existed as to how much of the mass of the attachments was actually effective in the blow. Lack of rigidity was another embarassment because the result depended largely on the nature of the base upon which the machine was mounted. In the design of the Eden-Foster repeated impact machine these requirements have been fully met. The hammer is without attachments and falls freely under the influence of gravity, the whole falling mass of the hammer is symmetrically disposed above the point of impact and the actual height of the fall may be measured easily so that the true energy of the blow is calculable to a high degree of accuracy.

A very useful 50 ton tensile machine of the Amsler type does all the work necessary for compression, transverse and bending tests.

Photo-micographic cameras are listed, which are of use in a study of steel and aluminum alloys.

The Mojonier moisture testers look like very handy instruments for testing the moisture of spruce and other timber.

International Rally at Loreto, Italy

In September, 1921, there will be held in Loreto, Italy, an international rally of aircraft, both lighter and heavier than air to assist in the annual ceremony in honor of Our Lady of Loreto, who is the Italian patroness of aviators.

There will not be any races or special competitions, the only aim of the holiday being to renew acquaintances, and maintain good friendships between aviators of Allied countries and establish the same for other countries that did not participate in the war.

The machines invited to this rally will be sheltered in the Aerodrome of Loreto, if land machines or airships, or in the nearest port of Recanati if they are seaplanes.

In addition to the religious ceremony of the benediction of the machines, there will be exhibition flying, banquets and the distribution of souvenirs for machines and pilots.

The Italian war and navy departments and the Aero Club of Italy are backing this ceremony; and although it is a religious one, it is not limited to catholic machines because it has a more higher significance. So all countries of the world are cordially invited to participate at the Rally, and the Italian Committee trusts that it can have as guests also some U. S. pilots and machines.

As in August there will be held in Venice the Schneider Seaplane Race, some of the participants may find it possible to join the Rally at Loreto.

Aircraft Underwriters Confer

The Executive Committee of the National Aircraft Underwriters Association has been meeting during the past two weeks to consider aircraft problems for the season 1921. A preliminary review of the experience showed a high loss ratio for the season 1920 Ways and means were discussed of improving the experience for the coming season There are five general ways of accomplishing this (a) increase rates; (b) better selection of risks; (c) safer flying and education in accident prevention work; (d) limit the coverage, (e) reduce loss costs and repair bills.

Each of these means has its limitations. Ordinarily an increase in rates would produce a corresponding decrease in loss ratio On the other hand the selection is apt to become worse as the rates are increased. If higher rates are charged a large proportion of the business is apt to come from those assured who take out insurance because they feel quite sure of a loss during the policy period. The result is that an increase in rates sometimes acts only to aggravate the loss ratio

The Executive Committee of the Aircraft Underwriters Association decided therefore that the rates should be kept down just as far as possible and that other ways and means should be found to improve the loss ratio

A better selection of risks will undoubtedly improve the experience But this method also has its limitations Improved inspection service and added knowledge gained from year to year is going to make it possible for the companies to weed out the poorest risks. But the companies cannot hope to completely cure the bad loss ratio by this process alone

The entire aircraft industry is actively interested in the improvement of flying conditions to the end that accidents may become fewer and fewer Insurance companies can and will lend a hand in this work Any reduction in the accident ratio will result in a corresponding improvement in the experience. A program has already been outlined for cooperation with the Underwriters Laboratories in Chicago This program is quite comprehensive Types of aircraft will be rigidly inspected, individual aircraft will be periodically examined, airdromes will be listed and graded and pilots will be licensed. It will be a little while yet before the plans are in operation, but once the program is under way the companies and the aircraft business as a whole may expect a lasting benefit.

The fourth means of improving the experience is by limiting the coverage. The deductible clause has been adopted for the collision coverage and will be continued for the coming season

The fifth means mentioned is to reduce loss costs and repair bills. Aircraft service depots are comparatively few in number, so the expense of repair is comparatively high The adjustment costs are slightly higher than they would otherwise be, because the business is scattered around the country. It is expected that repair costs and adjustment costs will come down as the business increases

The Executive Committee has decided on a comprehensive plan of keeping experience on the aircraft business Most of the experience is written on a six months' basis so the majority of the year's business is fully earned at the end of December The Association will therefore undertake to study losses and their causes. A study of the causes of accidents will not only help the insurance companies, but may prove of value to the aircraft industry as a whole.

Peru Developing Military and Naval Aeronautics

Peru is showing great enthusiasm in organizing both a military and naval air service. Major Sison of the R.A.F. has been lent by Great Britain to the Peruvian Government, and the first ten of a consignment of 110 hp. LeRhone-Avros have been delivered.

The Minister of War, Col Castro, and his staff have been highly pleased with the demonstrations made by Major Sison in an Avro, Major Gaudcuret on a Morane monoplane, Lieut. Romanet in a Salmson and Lieut Pootzel in a Caudron

The naval organization is under the direction of Capt. J. Leguira, son of President Leguira, and a staff of pilots and ground engineers from the U. S. Naval Air Service are in charge of instruction.

The President Has Announced

A POLICY
OF ENCOURAGEMENT OF MILITARY AND CIVIL AVIATION

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